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ABSTRACT

This document reviews evidence on the effects of early childhood intervention programs. A brief discussion of the issues surrounding the support and funding of compensatory education is presented and 10 preschool intervention programs (involving more than 2,000 children in various experimental and control groups) in which evaluation data were collected are described. Results of the pooled data were interpreted as showing that the initial gains in IQ scores obtained immediately following the termination of an intervention were decreased before the child entered school if intervention was not continuous. School-age results, when available, showed that IQ scores, if not as high as they were immediately after preschool intervention, appeared to be higher than they would have been without intervention. Evidence further suggested that earlier and longer intervention produced better results. Those studies which emphasized individualized instruction in the home or in a center seemed to show positive effects more consistently than those in which intervention occurred in small groups. Family involvement in the intervention was also identified as an important variable. It was concluded that the weight of evidence available at this time shows positive results for early childhood intervention programs. (JMB)

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The Effects of Early Childhood Intervention*

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In the intense competition for this nation's resources the priority for children faces dwindling support. At a time when teenage crime and delinquency is the highest in our history, and when the reading level of the poor in the public schools is at an all time low, the suspicion is increasing that if Americans do not outright dislike their children at least they ignore them. We seem ready to default on the promissory note of universal education and prepared to exchange its costs for as yet unspecifiable allocations for increased correctional institutions and remedial services.

The average poor child is not deriving the benefits from schools that his middle-class peer is.

In 1974 there were two high schools in Manhattan where 100% of the students were reading at grade level or better. But there were seven public schools in Manhattan with 6,500 students where only 7% were reading at grade level or better. Eighty percent of that 6,500 were reading two years behind grade level. In New York, the term "learning disability" is applied to children reading two years or more behind grade level.

As for crime rates, the most recent Federal publication on the state of children in the country reports that while juvenile crime is rising at every age, the age group in which it is rising fastest is for children under 16.

Presently, the Federal government spends 1.1 to 1.4 billion dollars annually on a variety of children's

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services. In the establishment of priorities for available resources, that money is not reserved for children. If funded programs are discontinued, resources formerly available for children may be allocated elsewhere.

About 450 million of that billion dollars is presently used for Headstart, which was created to enhance social competence in disadvantaged children. Edward Zigler, former Director of HEW's Office of Child Development, has defined that desired social competence as "the ability to master appropriate formal concepts, to perform well in school, to stay out of trouble with the law, and to relate well to adults and other children."

Headstart is in serious trouble. When Congress next votes on whether or not to maintain present funding, the outcome is by no means certain.

Headstart has been under attack by those who maintain that no evidence exists that it does any good. Usually that attack is carried with evidence that preschool IQ's, raised during and immediately after early childhood educational intervention, drop back to the level of control groups before the child begins formal schooling. Those attacks need examining and the evidence on the effects of early intervention needs reviewing.

Social and behavioral scientists' views about the effectiveness of compensatory education may be roughly grouped into three categories: (1) those who contend that it has not worked and cannot, since through generations of selective mating the poor have become genetically inferior, incapable of responding to the stimulus of public education as their middle-class peers can; (2) those who contend that it has not worked because the few hours weekly spent in an educational program are insufficient to counterbalance the negative forces in the child's home and community environment; and (3) those who contend that there is evidence of positive effects upon subsequent school performance, and that the jury is still out on most questions related to issues such as crime and delinquency.

The voices which ascribe a genetic basis for the average performance of populations in the public schools are not many but they are loud. It is an old hypothesis which surfaced to public attention because of an article in the Harvard Educational Review by Arthur Jensen in 1969. Entitled "How Much Can We Boost IQ and Scholastic Achievement?", his opening sentence was "Compensatory education has been tried and apparently it has failed." What followed was

a discussion of the nature of intelligence and argument that IA as measured by some traditional measures associated with that acronym did in fact measure what intelligence is; a review of evidence he believed supported the notion of heritability for that characteristic based largely on Cyril Burt's twin studies conducted with middle-class whites in Britain and the United States; and conclusions that some populations, particularly Blacks, were genetically inferior with respect to the manipulation of abstract symbols and problem solving. While only about 10% of the article had reference to Blacks and only a little more to the subject of scholastic achievement, what he said about Blacks appealed to the news media and what he said about scholastic achievement was "the heritability of scholastic achievement is much less, on the average, than the heritability of intelligence," and later, "The proper evaluation of such (compensatory education) programs should therefore be sought in their effects on actual scholastic performance rather than in how much they raise the child's IQ." This writer for one cannot fault Jensen for presenting a hypothesis and then martialing the evidence he believes supports it, which is what he did in the bulk of the article with respect to his definition of intelligence and the genetic basis for it. What has been little noted in journalistic media, at least, is the fact that he contended that compensatory education had failed and stated paradoxically that the only measure to be used to determine whether it worked or not was in subsequent scholastic performance. This, in 1969, when the vast majority of children participating in such programs had not yet been assessed in school!

In other places or other times the Harvard Educational Review article would probably never have surfaced to public attention. It would have been grist for the academic mill, debated in small conferences and rejoined by other articles in scholarly journals. But with this nation's sensitivity in the late 1960's about the Blacks, and with the total commitment to environmentalism which had provoked the allocation of vast federal expenditures to modifying the environmental conditions of the poor, Newsweek, The New York Times, Atlantic, and other literate periodicals embellished the theme of the IQ and the pros and cons of it heritability. The crucial issue posed by Jensen was lost. Does compensatory education influence subsequent school performance? Does early intervention effect reading ability, arithmetic competence and other school-taught skills which presumably we still believe are related to whether of not a child can assume a role compatible with himself and with society?

Those who say that the amount of time the child is exposed to compensatory education program is insufficient to counteract the devastating effects of the ghetto home and community rarely subscribe to Jensenism. Nor do they take the position that nothing can be done. Their point is that Headstart or other interventions have not been effective. Working with the child is not enough. What is needed is an all out effort to identify the ecological variables of the family and community which need to be changed for the child's good as well as for that of the family and community, and to try to change them. The devastating effects of the environment cannot be changed until the environment itself is changed.

An outstanding proponent of this position has been Professor Urie Bronfenbrenner of Cornell University, a distinguished expert on child-rearing practices. From an address before the American Psychological Association in 1974, he said, "Recently, I completed a report for a committee of the National Academy of Sciences reviewing available research on early intervention projects conducted over the past ten years. Although there were some modest achievements, by and large the results were disappointing. The effects were at best short-lived and small in magnitude, with substantial overlap in the distributions for experimental and control groups. In short, my optimism about the plasticity of the developing organism (read children) and its responsiveness to environmental change turned out to be ill founded."

And from that report to which he refers, "it is clearly evident from every project that preschool intervention is effective in producing substantial gains in IQ that are generally maintained so long as the program lasts...the experimental groups do not continue to make gains when the intervention is continued beyond one year and...one year after intervention is terminated, the IQ of the 'graduates' begins to drop, the difference between the experimental and control groups gradually decreases, the once impressive gains are reduced to a few points, and, what is most crucial, the average IQ of the experimental group often falls back into the problem range of the lower 90's and below."

So it is that these two different groups of child experts, miles apart in theoretical persuasion, have joined in concluding that working with young children to provide them with experiences relevant to subsequent school and social performance is not effective. The extent to which they have influenced decision makers cannot be specified, but that they have been heard and noted is uncontestable.

Than there are those who say there is data to show that early intervention can influence school performance. They contend you cannot determine the effects of compensatory education on scholastic performance until the children concerned get into school. Acceptable measures of, say, reading achievement are just not available until about the third grade, and reliable statistics on crime and delinquency are not available until the teens. Furthermore, results available today are for those studies which used our first approximations of what early intervention should be. As we learn more about the developing child from basic research, we will improve methods of early intervention. As we learn more about delivery systems and program administration, we will more effectively bring the results of new knowldge to bear on the individual child.

Large sums have been invested so that the effects of compensatory education can be evaluated. The social and fiscal climate makes it unlikely that new evaluations will be started in the foreseeable future. These evaluations are the only data base that exists to determine whether or not intervention works. The children concerned are just coming of age when school and delinquency data can be gathered. Don't deprive the nation of its only chance to determine what effect, if any, compensatory education has had. Debate the merits of the research after the data are in, but don't make the mistake of not getting it. The issue is too important to ask the jury to reach a verdict before all the evidence is presented.

There are a number of studies about the effects of intervention which were designed with the careful selection of subjects, the existence of appropriate control groups, the precision of implementation and the sophistication of measurement to qualify as research. Several of those have evidence about what happened to the children involved when they subsequently attended school. These are the studies to which we must turn to evaluate the effects of compensatory education.

In the descriptions that follow it would be endlessly repititive to provide details about subject selection, research design, and the logistics inherent in conducting each individual study. Yet to provide a perspective within which all of these studies must be judged, some detail about one is needed to communicate the nature and extent of the effort involved in each. Perhaps some detail about the study I know best will suffice to provide that perspective.

In 1963, with funding from the National Institutes of Health, I had the opportunity to begin to investigate an aspect of compensatory education. Would minimal intervention, two hours weekly for eight months, have an effect on the subsequent scholastic achievement of children who were 24 and 36 months of age when intervention began?

On 126th Street between Charlie's Bar and the 24th Precinct Station on the one side and the Catholic school at St. Nicholas on the other, the Harlem Research Center was established. Before it was renovated for our purposes it had been a heavy machine shop, located in a second floor loft. Three hundred and ten 2- and 3-year old children climbed those stairs twice weekly for the next two years.

The children were selected from 1500 birth records of those born in the Harlem and Sydenham Hospitals between August and December of 1964. They were all male and they were all Black. Males because the developmental differences between boys and girls were judged to be a variable which if studied would have required twice the sample size, resources, facilities and staff. Blacks because the research design required children from a broad range of social class who lived in a manageable geographic area. Harlem is not all ghetto. Many of its residents are middle and upper middle class families. Each child had been over 5 pounds at birth. All had parents who spoke English as a first language. None had mothers with a history of narcotics addiction. Half were from families whose head of household was unemployed, on relief or receiving Aid for Dependent Children. The other half were sons of the employed, ranging from those minimally supported in menial jobs to a few who were by any definition upper middle class. None were what Gunnar Myrdahl described in The American Dilemma as the under-class--those children born without benefit of physician or clinic. We don't know how many of these there are in this country. By the nature of their existence they defy the census.

The 310 children who participated in the study were selected for predetermined social class criteria. That selection process required over 700 home interviews attempted and over 500 achieved. The participants were assigned randomly to three groups: 120 to be exposed to the program at 24 months; 120 exposed at 36 months; and 70 controls. The original research design required that all be assessed annually until they completed the first grade.

The children who participated each year were then assigned randomly to one of two types of intervention: a

structured curriculum designed to teach simple concepts believed to be prerequisite to subsequent learning; or no curriculum or other formal training, whose members otherwise would be treated identically to the concept training group. For want of another name, they were called the Discovery group. They attended the Center on the same schedules, interacted with the same instructors and were surrounded by the same training materials. Thus, in the jargon of our trade, social class, age of intervention and type of intervention were co-varied in the research design.

The rationale for the Concept Training was simple enough. It was assumed that certain simple concepts must be acquired before more complex ones are acquired. Up, hard, long, under, and same as and their opposites down, soft, short, over, and different from are eventually learned by healthy children everywhere. The environmental stimuli conducive to acquiring those concepts are present universally regardless of culture or language. The earlier the child learned those concepts the earlier he could acquire more complex ones related to school performance.

To determine the order in which those concepts should be taught, the 120 2-year-olds were given a test to determine what proportion of them already knew each of 40 such concepts. Those which were known by the largest proportion of children were taught first (over 90% knew on top of at 24 months) and the rest were sequenced in the curriculum as a function of their relative difficulty.

The concepts were taught in a one-to-one teacher-child interaction twice weekly in one-hour sessions for eight months. Each child in the Training group began in the curriculum at his own level as indicated by the pre-test results. Parents were asked to accompany the child during the first few sessions and as frequently thereafter as was possible, so that they would be completely comfortable with what was occurring with their child. The Discovery group received identical treatment except that the concepts were not taught, instructors did not initiate conversation with the child but responded to him if he initiated contact by gesture or verbally. Needless to say, the investigators predicted that the Concept training group would show the most pronounced durable effects over time, the Discovery group might show some effects and both might out-perform the control group.

How does one move 120 toddlers into a training center twice weekly for one hour and get them home after their instruction without chaos and confusion? One doesn't. But

with station wagons and drivers, each child was picked up twice weekly for eight months, delivered to the Center and returned to his home. The climax of chaos occurred on the hour from 9:00 to 5:00, five days a week, when eight were leaving the Center for home and eight others were arriving. From 10 minutes before the hour to the hour, 16 toddlers, instructors, drivers, parents or grandparents and assorted visitors milled around the waiting room with instructor-child and driver-child paris getting together. Things did not always go right. Once Donald Brown came in hand and hand with one driver, only to be picked up by another and taken home five minutes later. Presumably someone else had two hours of training consecutively; hopefully with different instructors. Overall, however, records showed that 80% of all appointments were kept. The day Martin Luther King was killed and Harlem was burning it was slightly lower, but they came--and all of the staff but one was present.

At the end of the eight months of training for the 2-year-olds, they and the controls were assessed on a battery of 14 measures of cognitive, motor and perceptual performance. Both groups of participating children out-performed the controls on all measures but two. Stanford Binet IQ's for the experimental groups averaged 100. The controls averaged 92. The only difference between the Concept Training group and the Discovery group was that the former knew more of the concepts which the curriculum was designed to teach. The middle-class children performed no better than the lower-class children.

One year later these children who were trained beginning at 36 months were assessed, and those who had been trained at two were brought back and assessed again, as were the controls. The results were about the same. Those trained at three were superior to the controls on most measures. Those who had been trained at two continued their superiority over the controls a year after their training had ceased. No differences of practical significance existed between the Concept Training and Discovery groups. The middle-class children out-performed the lower class on one or two measures, but the results demonstrated that at three years and eight months those differences were not compelling.

When the children were four years and eight months old, those trained at two were two years beyond the intervention and those trained at three were one year beyond. Minor differences still existed between the participating children and their controls but the case was not strong. Co-variate analysis with IQ at age three as the co-variate demonstrated

that differences existed if the sum of all measures were combined, but no differences existed on any single measure of practical importance. The intervention children in both groups had not lost much on standard measures of intellective function (e.g., two points on the IQ), but the controls appeared to be catching up. Still no differences between Concept Training and Discovery. But significant differences between middle and lower class emerged both for experimental and control children. By age four years and eight months, the effects of social class was clearly manifest in the children's performance whether they had been exposed to intervention or not.

It was 1969; research support by the federal government was harder to come by; the doubters about the effects of intervention were publicly declaiming its failure. The research review committee approved continuation of the research but funds were not available for it. Small sums were found in 1970 and 1971 to continue analysis of the data and to keep in touch with the families concerned. Assessment in the first grade never occurred.

In 1975, however, when the modal subject in the study was in the fifth grade, the Education Commission of the states provided funds to locate and assess the Harlem study sample.

As of now data exists for 233 or the 295 children (79%) who are valid subjects today of the 310 who began the study in 1964. Of the 15 children who are not considered a valid part of the study at this time, 18 did not complete the training program in 1967 or 1968, and seven were never located for assessment immediately after training nor at any time since. We have some data on 51 of the original 68 Controls (75%) and 183 of the 227 experimental subjects (80%). But complete data do not exist for all subjects.

The most complete data are for 1975, when the boys were 11 and the modal subject was in the fifth grade. We have 159 IQ's, 173 arithmetic achievement scores, and 169 reading achievement scores for that year. For each measure, the proportion for whom scores are available for control and experimental groups does not differ. For example, 1975 arithmetic scores are available at this time for 62% of the experimentals.

Attrition analysis, conducted by comparing IQ's and social class at ages three and five (the last assessment) for those found and not found in 1975, showed no significant differences between any of the groups in the design.

The mean IQ (WISC) for the four experimental groups [concept training (CT), discovery training (DT), trained at age two (T-2), and at age three (T-3)] were significantly higher than the controls (99.2 vs 93.2). Three of the experimental groups were significantly higher than the Controls: CT ($p<.01$), T-2 ($p<.05$) and T-3 ($p<.025$), but DT was just short of the .05 level of confidence ($t=1.50$).

For reading achievement the four experimental groups had higher scores than the Controls (5.01) or the Comparison group (5.0) by an average of one to four months, but only T-3 was significantly so ($p<.05$). Those trained at two, T-2 (5.09) were not as advanced as T-3 (5.37), but that difference is not statistically significant.

For arithmetic achievement the average child in the experimental groups (5.30) was more than six months advanced over the controls (4.68). Each of the four experimental groups was significantly more advanced than the controls (T-2, $p<.05$; T-3, $p<.005$; CT, $p<.025$; DT, $p<.025$).

And most significant of all, both with respect to the impact on the life of the boys and statistically as well, is the fact that 45% of the Controls as compared to 22% of the Experimentals are one or more years behind in grade in 1975 ($X^2=11.54$, $df=172$, p .001).

This last finding suggests that the findings presented for reading and arithmetic are conservative. The average achievement score for the fifth grade in Central Harlem in 1975 was 5.0 and an estimated 4.8 in arithmetic. Those averages are for the boys who had made it to the fifth grade, and many do not make it along with their age group. The data presented for our sample was the achievement score obtained in 1975, whether or not the child was in the fifth grade. Thus the comparisons are between our sample in 1975, when 25% of the sample was behind one grade or more, with all of the boys in the fifth grade, many of whom had been set back as well. Rather solid evidence for the effects of early intervention, particularly when the treatment embraced only two hours weekly for eight months.

There is other evidence that intervention has durable effects on IQ scores and reading level. The studies discussed below are remarkably similar with respect to two findings. Regardless of how control groups are selected, or the locality of the disadvantaged area from which they come, they consistently show IQ scores in the low 90's and several months to years decrement in reading level. These untreated samples are the control groups with which children

given compensatory education are compared. Where early education has been provided, regardless of the curriculum used, durable effects on IQ and reading are more often found than not.

Professor Martin Deutsch
New York University, New York, New York

Professor Deutsch was the first to attempt the systematic evaluation of early educational intervention and its subsequent effects. His Institute of Developmental Studies was formed in 1958, and shortly thereafter 62 disadvantaged children largely from Harlem were exposed to an enriched prekindergarten program. Three additional annual waves of children followed, so that a total of 275 children have been exposed to early childhood training in this study. Since his facilities and funding could not meet the demands of all of the parents who requested admittance for their children, one of his control groups, 142 children, consisted of those who applied but did not participate. A second control group totaling 180 children began kindergarten at the same time those who participated in his prekindergarten program did. A third control group of 183 children was formed and consisted of children who began school in the first grade. Varying proportions of each sample was tested through the third grade.

His enriched prekindergarten curriculum focused on four areas of development: language, concept formation, perceptual and cognitive and self-concept. Techniques and procedures for early learning included: designing the physical facility for a comprehensive and effective learning environment; providing self-pacing activities and promoting individual children's competence for learning; individualizing instruction; promoting linguistic interaction between children and teachers; and maintaining the continuity of instruction by carefully predetermined activities and tasks. The scope and substance of his curricula expanded with successive waves of children so that each did not receive identical treatment. For later waves the intervention was extended into the first three grades of the public schools.

While Dr. Deutsch used several measures of intellective performance at different age levels as the children progressed through school, the Stanford Binet IQ scores and the reading scores from the Metropolitan Achievement Test are best compared with the other studies discussed. Perhaps because of funding or the vicissitudes of a child's life in the New York Public Schools, the attrition rate for his original subjects was high. Of the original 275 children

who had prekindergarten training, data are available for 82 at the end of the third grade. A similar rate of attrition occurred for his control groups.

However, of those children who were identified and tested in the third grade, those who had received the prekindergarten training performed consistently better than the control groups. On the Stanford-Binet IQ the average score for those receiving the early training was 100 after that program was completed. By the end of the third grade that average had dropped to 97, but was still significantly higher than all three control groups, whose average was 91. The children who had received the early training and for whom reading scores were obtained in the third grade were slightly ahead of the control groups in their ability to read.

Professor E. Kuno Beller
Temple University, Philadelphia, Pennsylvania

Professor Beller asked about the effects on subsequent school performance of having begun formal schooling at the nursery level (age four), kindergarten (age five) and the first grade (age six).

His subjects were drawn from the constituencies of four public schools in an urban slum area of North Philadelphia, the family median income of which was $3,383. Parents of the four schools were informed that a nursery school would begin at each and were invited to apply if they had children of appropriate age. From those applications each school selected at random 15 children to attend. Group II in the study consisted of 53 five year olds who entered one year later the same kindergarten classes as the children in Group I, but who had no nursery experience. All children from Groups I and II were assigned in first grade classrooms when they reached that grade level so that an equal proportion of each group would have the same teachers in the four schools. Group III was selected from the first grade classrooms in which Groups I and II were, and consisted only of children who had no previous nursery or kindergarten experience. Group III children were comparable to Groups I and II with respect to age, sex and ethnicity. All three groups were kept together with the same classrooms and the same teachers through the second grade, after which they proceeded to other schools in Philadelphia according to normal procedures of school assignment. By the fourth grade, the children were distributed over eighty different schools. The study was extraordinarily successful at following the progress of the children in the third and fourth grades despite what

schools they subsequently attended.

Group I, the nursery program children, were attended by a head teacher and an assistant teacher in each of the four classes of 15 children. Classes operated four days a week with the fifth school day reserved for teachers visiting homes, arranging for family contact with appropriate social agencies, and participating in an in-service teacher training program. The nursery program was traditional, with specific objectives of (a) emphasizing the need to compensate for the deprivation in the lives of the disadvantaged children, (b) helping the teacher understand the learning deficits accrued from the children's environments, (c) helping the teacher identify specific learning deficits and develop remedial learning experiences, (d) to develop specific curricula appropriate for the children, and (e) to help the teachers recognize the need to work with parents.

Standard measures of intellectual functioning and academic marks were obtained for each grade level to grade four, and a measure of impulsive and reflective cognitive styles was administered at grade four. In addition, extensive measures of socioemotional functioning were obtained.

On the Stanford Binet IQ, the remarkable consistency of scores which averaged around 90 was manifest in all three groups at the time they began schooling regardless of age. The 57 who began at age four (nursery) averaged 92; the 53 who began at age five (kindergarten) averaged 91, and those who began school first in the first grade averaged 90. Those children who began in nursery school achieved an average of 98 in kindergarten and maintained that average through the fourth grade. Those who began at kindergarten accelerated to 94 in the first grade but dropped back to their original average of 91 by the fourth grade. Those who began the first grade at 90 continued that average through fourth grade.

Academic marks showed a less consistent trend. For girls, those who began school at nursery level were consistently higher than Groups II and III in arithmetic, reading, spelling, science and social studies. Those who began in the first grade were consistently lower on those marks than those who began in kindergarten. But for boys, while those who began school at the first grade level were consistently lower than those with previous school experience for all marks, those who began at the kindergarten level were just as consistently higher than those who began in nursery school. The regularity of results for Beller's data is all the more remarkable because in the fourth grade

the children concerned were in eighty different schools. In general, children who had started school earlier were more reflective than those who began later, but the results were more pronounced for boys than girls.

Professor Beller concluded from his study that "the timing of educational intervention in early childhood had immediate and prolonged effects on a wide range of the child's socioemotional and intellectual processes."

Professor Merle Karnes
University of Illinois, Champaign-Urbana

Professor Karnes asked would the Karnes Preschool Program produce greater or more lasting effects than traditional preschool programs? Her subjects were 60 4-year-old children from families in the Champaign-Urbana area who were classified as socio-economically deprived using Headstart guidelines. Two classes of 15 children each received the Karnes Program and two received traditional training. Both classes had a teacher-pupil ration of one to five. The children in the Karnes program were subgrouped into small flexible groups of five children to one teacher daily for three structured periods of 20 minutes duration in language, mathematical concepts and science/social studies. The remainder of the 2 1/2 hours the children were in school was devoted to large group activities--music, art, directed play, rest and snack time.

The heart of the Karnes program is a special language model used to guide instruction since inadequate language patterns were thought to be the greatest problem area of low income children. A game format involving many different kinds of materials were used to encourage children to talk about their experiences. Particular attention was given to helping children develop abilities to receive, think about and communicate a wide variety of ideas.

The traditional preschool program with which the Karnes program was compared had as its goals the promotion of the personal, social, motor and general language development of the child. The teachers were instructed to capitalize on opportunities for incidently and informal learning, to encourage the child to talk and ask questions and to stimulate their interest in the world about them. Because the traditional program was implemented within a research setting, we may assume that the calibre of instruction and materials would be somewhat better than normally found in most nursery schools.

Immediate post-program effects showed that the Stanford-Binet IQ scores had risen on the average of 14 points to 110 for the Karnes group and eight points to 102 for the traditionally trained children. Since the national average IQ score is around 100, and the average IQ score for poor children at that age is in the low 90's, the immediate effects were impressive. By the time the children had completed the third grade, about half of the original IQ gain had been lost by the Karnes group to 103 and the traditional group to 100, a lesser loss. However, both groups were significantly higher in IQ in the third grade than they had been at age four and both approximated the national norms. Thus, while there was a decrement between the end of the program and the third grade, the results indicated that the children involved in both intervention groups were higher than they would have been without intervention.

Reading achievement at the end of the third grade was determined by the California Achievement Test, a widely used measure for which national norms exist. The Karnes group scores were equal to the national norm, but the traditionally trained children were lower than average. While Karnes did not include a group of children who had no intervention at all in her study and for a variety of reasons control groups frequently increase in their performance, Karnes concluded on the basis of comparisons with the national norms that a lasting effect had been made on the children exposed to her carefully designed program and that the traditionally trained children evidenced positive effects though not so pronounced.

The social relationships of children in the public schools contributes greatly to the child's success. A follow-up study of children in both of the above programs revealed that children from the Karnes group were more socially accepted than children from the Traditional group. In addition, the Karnes children indicated that their teachers valued them more highly than did the Traditional group.

Professor Louise Miller
University of Louisville, Louisville, Kentucky

Professor Miller compared the benefits of four established preschool programs. There were 248 children involved in the study who participated in Headstart or had no prekindergarten experience. All were from one of four socioeconomically disadvantaged areas of Louisville which were characterized in the 1960 census as being from 45% to 85% Black with an unemployment rate at that time of 7.5% to

12.5%. Thirty-four children, 22 of which were on the Head-start waiting list, and 13 from the same areas, had no intervention and served as controls. The 214 others involved were randomly assigned within areas to one of four interventions.

The four programs she studied were: Montessori, Bereiter-Engelmann, DARCEE, and a traditional nursery school program. All but Montessori assume various motivational and experimental deficits and emphasize linguistic development. Montessori differs sharply from the other three. It assumes that the child, disadvantaged or not, is naturally curious, eager to learn and capable of intense concentration. All but the Traditional program involve the careful sequencing of tasks and a highly academic content. The Traditional program emphasizes emotional needs, DARCEE the development of aptitudes and attitudes, Bereiter-Engelmann the development of academic skills through rigorous drill, and Montessori focuses on long-term cognitive development. The Traditional program and Montessori are child-centered and individualized which the other two recommend didactic instruction in small groups.

From September, 1968, to June, 1969, the children participated 6 1/2 hours daily, with one hour for napping and other periods allocated for outdoor activities, lunch and snacks. The effects for all four programs were measured at the end of the program and annually thereafter until 1972 when the children had completed the second grade.

Most measures of behavioral change showed significant gains for all four programs over the controls at the end of the programs. Particularly, the Bereiter-Engelmann children led with respect to cognitive and academic performance, the DARCEE program made its maximum impact on motivation and attitude change, the traditional program related to the highest scores on measures of curiosity and social and verbal participation and Montessori goals were reached in two areas with high scores on inventiveness and curiosity. In general, the immediate effects of the four programs showed that each had achieved its goals over the control group to one degree or another.

At that time the IQ scores of all four experimental groups were consistently higher than those of the controls. By the end of the second grade, however, all four groups dropped sharply--with girls scoring lower than boys. Scholastic performance in the first and second grades was measured with the California Achievement Tests, which includes subtests for both reading and arithmetic. At the

first grade level all four interventions yielded higher reading scores when compared with the controls. In general, however, those advantages for the experimental groups no longer existed at the end of the second grade. The Montessori children were slightly but not significantly ahead of the controls in reading, but DARCEE and traditional were actually lower. On arithmetic, what few advantages the experimental children had had at the first grade level no longer existed, except that boys involved in the Montessori program were better. Dr. Miller concluded that different programs had different effects and that the characteristics of each program related to its effects must be identified so that appropriate sequences of experiences can be designed. As the programs now exist, no compelling case can be made for any one.

Abelson-Sykes, New Haven Project
Yale University

Drs. Abelson and Sykes have had quite different results than Professor Miller's in a slightly different context. In 1967 he began a study of children who had just completed Headstart and who were enrolled in a special continuing program (Project Follow Through, in Hamden, Connecticut). His control children, some of whom had had Headstart and some of whom had not, were enrolled in inner-city kindergartens in New Haven. Both the intervention and control children were tested when they completed the third grade, at which time a new group of third graders drawn from the same school systems were tested as well.

"Results indicated that positive effects of Headstart existed at the end of kindergarten and first grade for both those children who had received the continued intervention of Follow Through and those who had not. At the end of third grade, effects of Headstart were no longer found for those children who had been attending inner-city schools since the Headstart experiences. Children who had received Headstart and Follow Through intervention, however, scored significantly higher than did control children on measures of academic achievement, IQ, and social-emotional development."

When their sample was tested three years later in the sixth grade, 42 children who had had both Headstart and Follow Through continued to out-perform the same 26 control children on IQ, general information scores and mathematics achievement.

In 1968 he essentially repeated the above study with a new class from Headstart. Results from the second cohort are a little different. The intervention group did not show superiority over their controls at the end of the third grade. At the end of the fifth grade, however, the children with Headstart experience were again superior to their controls on three of five measures of academic achievement: reading recognition, spelling and general information.

That finding suggests delayed positive effects ("Sleeper effects"), where differences are found at older ages when none were found earlier. They concluded that "the evidence points to the conclusion that the gains accruing from compensatory education programs are commensurate with the duration and amount of effort which are expended on these programs." He may well have added that gains also may depend upon the age at which intervention is introduced, as some of what follows will indicate.

Dr. David Weikart
High/Scope Educational Research Foundation
Ypsilanti, Michigan

The Ypsilanti (Michigan) Perry Preschool Project was among the first studies designed to determine the effects of early intervention with the disadvantaged child. From 1962 to 1967, 123 children three and four years of age participated in a cognitively oriented program; an equal number of controls had no intervention except for annual testing. Both groups entered the Ypsilanti public schools at age five and were assessed annually thereafter on various measures of intellective performance and on scholastic achievement.

During the program and immediately after it the difference between experimental children and their controls was dramatic (e.g., 12-point differences in the Stanford Binet IQ), but once treatment had terminated and the children entered elementary schools the magnitude of those differences diminished. After the first grade no differences remained on the Binet, and teachers did not rate experimental children significantly higher for academic potential. However, the experimental children did consistently outperform their controls on the California Achievement Test, measures of reading and arithmetic achievement. Dr. Weikart concluded that while the initial gains shown as an immediate effect of preschool were not sustained, "the preschool experience prepared experimental children to cope more effectively with the demands of school."

Weikart used one measure of scholastic performance with such uncontestable face validity that one wonders why more studies do not include it among assessment of effects. What proportion of the experimental and control children were actually participating at the grade level conventional for their age? By the end of the fourth grade 83% of the children who had attended preschool were at conventional grade level as compared with 62% of the controls.

Professor Susan Gray
George Peabody College

The Early Training Project was conducted in 1962-64 with 88 families who lived in two small communities in Tennessee. In one community the three- and four-year-old children in those families, whose average income in 1963 was $1,700, were randomly assigned to three groups, two intervention and one control. In the other community, the distal control group consisted of families with similar demographic characteristics. The program for the first preschool group consisted of three 10-week periods for three successive summers of intervention in a classroom situation, plus weekly home visits during the intervening months between one summer session and the next. The focus of the home visits was to enable the parent to become a more effective teacher for her child. The second intervention group had two summer sessions and one year of intervention in the home. When children entered the first grade, the homes were visited twice monthly until the end of that year. Assessment occurred immediately after the children finished the program in 1965 and in 1966 and 1968 when the children had completed the fourth grade.

Dr. Gray reports "The experimental children, as compared to the two control groups, showed clear evidence of superiority on intelligence tests, language tests and on school achievement through the second grade. At the end of the fourth grade, the last time the children were studies, there was still a significant difference on intelligence tests but the differences on (school) achievement data, while in the predicted direction, were no longer (statistically) significant." She concludes by pointing out that most of the children in the sample attended segregated schools through the fourth grade, where "expectations for the children tended to be relatively low," and that the schools have been desegregated since. She suggested that the quality of the school that children attend following early intervention is an important variable when the effects of intervention are examined.

Professor Ira Gordon
University of Florida, Gainesville, Florida

Professor Gordon asked whether systematic interaction with mother and child beginning at birth has durable impact on cognitive development. His subjects were 204 children born in Gainesville and nearby towns between June 1, 1966, and November 1, 1967. All were recruited from families which met Office of Economic Opportunity guidelines for eligibility for its programs.

His study varied duration of intervention (one to three years) with treatment beginning at birth and ending at age 36 months. The intervention was characterized by weekly home visits to mother and child at which time maternal instruction and educational procedures and materials were disseminated and by the use of women, as parent educators, who were indigenous to the same poverty-stricken population. Emphasis during the year after the birth of the child was on the development of materials and procedures which were delivered to the family on a weekly basis by the paraprofessionals. The second year had similar goals except that the delivery system made available to the mothers provided content appropriate for ages 12 to 24 months. Intervention in the third year continued the weekly home visits and provided in addition seven "backyard centers," each located at the residence of a participating family and especially equipped for the activities in which the children would be involved. The children attended the centers in groups of five, twice weekly for four hours during which they were involved in instruction and group activities.

More than most studies, Gordon's was concerned with the spacing of intervention through time. His experimental groups consisted of families who participated all three years, the first and second two, or first, second, or third year only. Fifty-five of the 204 families involved received no intervention and served as controls.

All children were assessed annually at ages 24 months through 72 months on several measures. Only the Stanford Binet IQ is relevant here. Their performance at age six is the latest data available.

On the average children whose families received the intervention all three years, the first two, or the third year only, had significantly higher IQ's at age six than the control group. At that time the 41 controls available averaged 90.2, a representative finding for that age among

disadvantaged children, and the 67 children in the three experimental treatments averaged IQ's of 98. None of the other experimental groups, intervention at 12 months only, intervention at 24 months only, or intervention in the first and third year were significantly better than their controls.

Dr. Phyllis Levenstein
Family Service Association of Nassau County,
and the State University of New York at Stony Brook

Dr. Levenstein asked the question in her Verbal Interaction Project whether increasing the level of conversation and communication between mothers and children age 20 to 43 months of age would effect the cognitive and socioemotional growth of the children. The families concerned lived in Nassau County, New York, and are described as educationally disadvantaged because of poverty. The most recent data available are for 65 children who received two years of intervention, 39 who had earlier and shorter versions of the intervention and for 55 matched for socio-economic status but who had no intervention at all.

The intervention, called the Mother-Child Home Program, consisted of two, 1/2 hour visits to the home each week for seven months each year over two years. Using toys and books which required someone else's interaction with the child for full enjoyment and learning rather than those which provoke solitary play, the home visitor encouraged mother-child interaction with the toy. The visitor, called a "Toy Demonstrator," modeled for the mother activities which emphasized giving information about color, size and form, manipulations such as matching and building, eliciting responses from the child through questions and rewarding independence and curiosity. Illustrated books were always used with special reference to obtaining from the child questions about the pictures. During early sessions the Toy Demonstrator was the primary participant with the child, but had as her goal the eventual shifting of adult-child interaction entirely to the mother. The toys and books were permanently assigned to the child, to encourage post-program interaction. Dr. Levenstein's goal was to help low-income families assume the same educational function which many middle-class parents carry out informally in the raising of their children.

Successive cohorts of 21 (1968), 23 (1969) and 21 (1970) were in the second, first, and kindergarten grades as of the end of the 1974 school year. The average IQ for all of those children is now between 107 and 108, while 55 control children attained an average of about 92. Since

both experimental and control children when they entered the program averaged in the low 90's, the data indicate that those receiving Levenstein's treatment were 10-15 points above their original scores and the controls were about the same.

The reading and arithmetic achievement for experimental and control children on an achievement test with national norms showed similar differences between them. There are also indications that the experimental children are having fewer problems in school than the controls. From teachers' judgments and school records the experimental children are having significantly fewer academic and behavioral problems in school.

Conclusions

The ten studies described involved over 2,000 children in various experimental and control groups, most of whom have been followed through grade three or beyond by the investigators concerned. They represent several million dollars worth of research funded by federal agencies. No new research of such magnitude has been funded in the 1970's. Many of those studies were not actively following the subjects of their research in the early 1970's. Yet they are the primary data base for decisions about the value of compensatory education.

In general, the results so far show that the initial gains in IQ scores obtained immediately following the termination of an intervention are decreased before the child enters school, if intervention is not continuous. The Miller study shows that those initial gains may disappear entirely. Those preschool results were available to reviewers earlier than the evidence related to school achievement was, and presumably it is why Jensen, Bronfenbrenner and others decried the effectiveness of compensatory education. Where school-age results are available, they are consistently encouraging. IQ scores, if not as high as they were immediately after intervention, appear to be higher than they would have been without intervention. Scholastic achievement in reading appears to be better, and in some cases the percentage of control children with academic problems is reported to be greater than their experimental peers.

Admittedly, there are questions about each of these studies which social and behavioral scientists must examine carefully before the results are unequivocable accepted. As attrition occurred in the experimental and control groups

between the beginning of a study and the latest age of evaluation, is there bias in who remained available? Were the experimental and control groups matched for intellective levels in the first place? Did those who did the assessing know which children had received the intervention and which had not, and if they did, was there bias in the administration in the tests or in the collection of school data? Any of these could effect the differences found in an individual study. The fact remains that most studies which have evidence on effects to the school age show that compensatory education has contributed to school performance, regardless of the type of treatment, the age at which intervention began, or the frequency or duration of treatment.

As to the philosophy, duration, age and intensity of treatment, the evidence is only suggestive as to which is best. Karnes, Miller, and Palmer varied philosophies of treatment and their results provide little or no evidence that one treatment is better than another so long as age and duration of treatment are held constant. The answer to that question may be that some children respond best to one and others to another. Research has not progressed beyond the randomization of assignment to treatment and control groups to determine the effects on the average child. Presently, there are no studies which deliberately assign children to one or another treatment on the basis of the characteristics of the child or his background.

As to the age when intervention first occurs and how long it lasts the evidence suggests that the earlier and longer the better. Gordon and Levenstein demonstrate effects from intervention at infancy; Palmer at 24 months. The work of Abelson-Sykes, Beller and Deutsch suggests that intervention beginning at age four, the prekindergarten year, is effective if continued during kindergarten and the first two grades. On the other hand, continued education up to and during the school years appears to be desirable but not essential. The Harlem study shows that two hours weekly at age two or three can be effective without subsequent treatment before the children go to school.

Those studies which emphasize individualized instruction in the home or in a Center seem to show effects more consistently then those in which intervention occurs in small groups. This is not new nor is it surprising. Mark Hopkins spoke of the educational benefits of an adult and a child on a log in the woods. We all know that even as adults certain insights are acquired best in the one-to-one context. A question for research is what can be taught as efficiently in groups as in the intimate association of two

persons alone. The significant other is an important aspect of everyone's environment, but for what kinds of learning it is most importnat we do not know.

Whether the mother or the family is involved in the intervention is almost certainly a compelling variable with respect to effects. Of the studies cited, Gordon's and Levenstein's have made that interaction a principal component. That component is, of course, related to the point that Bronfenbrenner makes. To the extent that we can influence the family with respect to behaviors related to child rearing we will make a more pronounced effect on all children. Few social and behavioral scientists would argue with that. One can even agree with Bronfenbrenner that identifying those aspects of the child's ecology relevant to his development, and changing them, would be the best of all possible worlds. It is with respect to his saying that intervention with the child alone has not been effective that we are, quite literally, throwing the baby out with the bath.

Type, age, duration, and intensity of intervention and the extent to which families are involved in it are crucial questions in the compensatory education picture because they are so closely related to cost. The longer intervention must last to be effective, the more hours per week the child participates, the extent to which individual instruction is essential, and the added benefits from having families involved--are all factors which will determine the ultimate cost of national programs if they are to continue. All of these issues are not going to be resolved by existing research because present studies are not designed to answer them even if they are allowed to continue. But existing research is related to the central issue presented at the beginning of this paper. Is compensatory education of value?

The weight of evidence available at this time is positive. One may criticize research design, selection of subjects, attrition, or other aspects of an individual study, but the fact remains that most have found positive results and continue to do so. Thanks to the Education Commission of the States, which with HEW's Office of Child Development in 1976 provided funds for all of the studies in the elementary grades--the evidence is mounting for durable effects on scholastic achievement.

With few exceptions these results are not directly related to Headstart. The interventions studied are not identical to many Headstart programs. There are, however,

similarities between the interventions studied and the average Headstart program, and data were increasingly available which deals specifically with Headstart itself.

The knowledge accumulating from intervention programs can be used to make Headstart more effective with respect to subsequent scholastic performance. And Headstart does much more than provide varying degrees of educational input. It provides hundreds of thousands of preschool children with dental and medical care and a minimal level of nutritional sustenance. Those noncognitive benefits are subjects about which Headstart's critics have been noticeably mute.

We cannot give up on early intervention as one strategy to reduce some of society's malignancies. We are faced with the almost certain spectre of huge costs associated with remedial programs and expanded correctional institutions. If our angry and uneducated youth continue in the direction they appear to be going--what option do we have to early intervention and the continued accumulation of knowledge so as to make intervention more effective?

The evidence is that compensatory education has not failed. To the contrary, the evidence is that it is a healthy child which needs continued support to reach maturity.